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BIOLOGICAL EVALUATION OF THE SOUTHERN PINE BEETLE ON THE BIENVILLE NATIONAL FOREST IN MISSISSIPPI

by

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A biological evaluation was conducted on the Bienville National Forest, Bienville and Strong River Districts, the weeks of August 20 and 27, 1979. The purpose of the evaluation was to determine the current status of southern pine beetle (Dendroctonus frontalis Zimmerman) populations on the forest and to determine what action, if any, would be necessary in FY 80.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except that survey coverage was 100 percent.[2/] The survey was made by district personnel and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Ten percent, or a minimum of 10 spots per district, were selected for ground checking using a stratified random sampling scheme. Spots were stratified by size class (1-25, 26-50, > 50 trees, aerial observation). Ground check data, including numbers of vacated and infested trees, were recorded. Bark samples (12" x 12") for attack:emergence analysis were collected (five samples, if ≥ 10 vacated and infested trees; three samples, if < 10 vacated and infested trees).

Attack:Emergence Evaluation

The attack:emergence analysis procedure for estimating subsequent tree mortality from SPB infestations was adapted as a predictive tool.[3/] [4/] This procedure predicts future spot growth based on the

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[2/] Detection of Forest Pests in the Southeast, 1970. USDA, Forest Service, Southeastern Area, State and Private Forestry, Publ. S&PF-7. Atlanta, Ga. 51 pp.

[3/] Moore, Gordon E. 1977. Factors for determining trends in southern pine beetle spots. J. Environ. Entomol. Vol. 7, No. 3. pp 335-341.

[4/] This methodology is being used on a trial basis. Further analysis and evaluation must be made before further use.

ratio of southern pine beetles entering the trees to the number of beetles emerging (this is both attacking adults and developed brood). For purposes of this evaluation, the procedure will be referred to as the attack:emergence ratio. A prediction of SPB increase would require an attack:emergence ratio of 1:10 or greater. Attack:emergence ratios for spots predicted to remain static in growth would be 1:5 - 1:9.9. A decreasing population would have an attack:emergence of less than or equal to 1:4.9. This procedure has been proven on a spot basis for a 2-year period in North Carolina.[5/] This evaluation assumes that spot growth as predicted by the attack:emergence bark sample analysis is indicative of SPB population growth on the forest on an area basis. For example, if attack:emergence ratios predict increased populations within the sample spots, then the assumption would be that an increased amount of volume will be lost (or an increased number of trees will be killed) by SPB area-wide on the district.

Volume Protected Determination

The volume which would be protected by having a suppression project was estimated by use of spot growth formulae. Spot growth formulae estimate the amount a spot would grow if not salvaged. The difference between salvage volume and the size the spot would have grown if left alone is the volume protected.[6/]

RESULTS

Aerial Survey and Ground Checks

Sixty-two SPB spots were found on the Bienville District ranging from 2 to 150 trees. Forty-three spots were in the 1 - 25 tree class, 13 in the 26 - 50 class, and 5 were in the > 50 class. The Strong River District had 55 SPB spots ranging from 5 to 300 trees. Forty spots were in the 1 - 25 tree class, 10 spots in the 26 - 50 class, and 5 were in the > 50 class. Ten spots were ground checked on each district: 7 in the 1 - 25 tree class, 2 in the 26 - 50 tree class and 1 in the > 50 class. Ground check data and attack:emergence bark analysis data are summarized in tables 1 and 2.

Attack:Emergence Evaluation

Attack:emergence ratios were found to indicate increasing SPB populations on both the Strong River District (A:E = 1:10.8) and the Bienville District (A:E = 1:10.5)(see tables 1 and 2). Based on the attack:emergence procedure, FY 80 losses should be at least 1.5 times the loss experienced in FY 79.

5/ Moore, Op cit.

6/ Hedden, R. L. 1979. Southern pine beetle spot growth inactivity in East Texas. Forest Sci. In press.

Table 1. Summary of ground check data and attack:emergence bark analysis data for Bienville Ranger District, Bienville National Forest, August 1979.

Aerial Size	Total No.	No. Infested Trees			No. Vacated Trees		Attack:Emergence Ratio
		Total	Green	Reds & Faders	Total	Reds & Faders	
70	249	136	94	42	113	102	1:12.11
50	198	100	61	39	98	43	1:16.54
40	271	101	57	44	170	68	1:11.27
25	148	69	45	24	79	40	1:12.31
20	83	51	35	16	32	27	1: 9.56
20	406	251	167	84	155	71	1: 8.78
12	24	0	0	0	24	20	a/
10	5	0	0	0	5	5	a/
10	18	1	0	1	17	4	1: 6.71
5	46	16	16	0	30	27	1: 6.77

a/ No attack:emergence ratio was calculated for inactive spots because of methodology recommended by G. E. Moore (see footnote 3 in text).

Table 2. Summary of ground check data and attack:emergence bark analysis data for Strong River Ranger District, Bienville National Forest, August 1979.

Aerial Size	Total No.	No. Infested Trees			No. Vacated Trees		Attack:Emergence Ratio
		Total	Green	Reds & Faders	Total	Reds & Faders	
150	162	45	6	39	117	59	1: 9.92
50	76	2	11	18	47	29	1: 6.08
50	60	21	15	6	39	29	1: 7.59
20	43	17	10	7	26	25	1: 2.10
20	19	1	1	0	18	6	1:21.03
20	60	19	6	13	41	16	1:13.68
10	11	0	0	0	11	4	a/
10	10	0	0	0	10	10	a/
5	9	1	1	0	8	7	1:15.00
5	19	0	0	0	19	10	a/

a/ No attack:emergence ratio was calculated for inactive spots because of methodology recommended by G. E. Moore (see footnote 3 in text).

Volume Protected Determination

Total volume protected as derived from Hedden's spot growth formula was found to be 1143.60 MBF on the Bienville District and 19.02 MBF on the Strong River District.

DISCUSSION AND RECOMMENDATIONS

SPB suppression activities should continue on the two districts of this forest with the aid of Forest Insect and Disease Management pest control project. A salvage control action will minimize losses and prevent spot growth by removing infested material from the forest. Chemical suppression and/or cut-and-leave tactics are recommended only for inaccessible spots or for small spots that cannot be administered any other way. Forest Insect and Disease Management, Pineville, La., should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures. If cut-and-leave is to be used, district personnel should plan a training session with FI&DM before the summer season (the summer is the only time this method is recommended for use). All suppression activity should be done in accordance with the 3400 section, FSM, and the project control plan for the forest.

Predicting future timber mortality is difficult due to the occurrence of overlapping generations of beetles each year. The attack:emergence technique used for this evaluation predicts a mortality trend. This prediction technique has been proven accurate on a spot basis, but work continues to adapt these predictions to an area basis. For purposes of this evaluation, assumptions are that spot sizes and distribution within each age class of timber will remain the same.

While direct suppression activities are necessary, it is also possible to reduce future losses through preventative measures. Maintaining healthy, thrifty stands is one of the better ways to prevent SPB losses. Prevention of future losses by both districts can come about by making an effort each year to identify problem areas (FI&DM will aid in this), and treat them silviculturally to either remove or lessen SPB hazard on a stand by stand basis. Here are stand conditions the prescriptionist should look for to reduce SPB losses:

1. Avoid basal areas in excess of 120 sq ft/ac. Older, dense stands should be thinned as heavily as R-8 guides allow.

2. Make sure species is matched to site.

3. Note presence of littleaf or annosus root rot sites. These sites have been shown to be problem SPB areas.

4. Plan for as little disturbance as possible when these stands are thinned. Damaged stands are more susceptible to bark beetle attack.

A vigorous SPB population capable of causing increased losses in FY 80 is present on both the Strong River and Bienville Districts. It is important that suppression action be taken to minimize timber loss and to stop spot growth in the larger spots. Because of expected SPB activity, the forest needs to plan enough technician time to implement the work required to meet project objectives.

For further information, contact Forest Insect and Disease Management, Pineville Field Office, Pineville, La., 71360 (Phone FTS 497-3311, or Commercial 318-445-6511, ext. 311).

WITHOUT PROJECT

Bienville District

1	Age	15	45	60	-	-	
2	Volume Threatened MBF	526.06	617.54	-	-	-	
3	Years to Harvest	45	15	-	-	-	
4	Volume at Harvest MBF	2041.11	759.57	-	-	-	
5	Green Stumpage Price $	200.00	200.00	-	-	-	
6	Value at Harvest $	408,222.00	151,914.00	-	-	-	
7	Present Value @ 6 7/8%	20,533.57	56,071.46	-	-	-	Total = $76,605.03
8	Present Value @ 10%	5592.64	36,292.25	-	-	-	Total = $41,884.89

9	Estimated Volume Killed	MBF	2,333.03	14 Threatened Volume Salvaged	-
10	Estimated Volume Salvaged	16%	373.28	15 Salvage Stumpage Price	-
11	Estimated Volume Lost	MBF	1959.75	16 Value of Salvage	-
12	Salvage Stumpage Price	$	130.00		
13	Value of Volume Lost	$	254767.50		

		@ 6 7/8%	@ 10%
17	Total Value Lost Without Project:	$331,372.53	$296,652.39

WITH PROJECT

1	Age	15	45	60	-	-	
2	Volume Threatened MBF	125.25	147.03	-	-	-	
3	Years to Harvest	45	15	-	-	-	
4	Volume at Harvest MBF	485.34	180.55	-	-	-	
5	Green Stumpage Price $	200.00	200.00	-	-	-	
6	Value at Harvest $	97,068.00	36,110.00	-	-	-	
7	Present Value @ 6 7/8%	4,882.52	13,328.20	-	-	-	Total = $18,210.72
8	Present Value @ 10%	1,329.83	8,626.68	-	-	-	Total = $9,956.51

9	Estimated Volume Killed	MBF	2333.03	14 Threatened Volume Salvaged	-
10	Estimated Volume Salvaged	MBF(80%)	1866.42	15 Salvage Stumpage Price	-
11	Estimated Volume Lost	MBF	466.61	16 Value of Salvage	-
12	Salvage Stumpage Price	$	130.00		
13	Value of Volume Lost	$	60,659.30		

		@ 6 7/8%	@ 10%
17	Total Value Lost With Project:	$78,870.02	$70,615.81

	@ 6 7/8%	@ 10%
Project Benefit:	$187,798.91	$161,332.98
Project Cost:		
Net Present Value:		
Benefit Cost Ratio:		

WITHOUT PROJECT

Strong River District

1	Age	35	45	55	Mature		
2	Volume Threatened MBF	6.29	53.45	50.30	25.15		
3	Years to Harvest	25	15	5	0		
4	Volume at Harvest MBF	10.00	65.74	53.32	25.15		
5	Green Stumpage Price $	200.00	200.00	200.00	200.00		
6	Value at Harvest $	2000.00	13148.00	10664.00	5030.00		
7	Present Value @ 6 7/8% $	379.90	4852.93	7649.82	5030.00		Total = $17,912.65
8	Present Value @ 10% $	184.60	3147.63	6621.28	5030.00		Total = $14,983.51

9	Estimated Volume Killed MBF	655.43	14 Threatened Volume Salvaged	-
10	Estimated Volume Salvaged MBF 16%	104.87	15 Salvage Stumpage Price	-
11	Estimated Volume Lost MBF	550.56	16 Value of Salvage	-
12	Salvage Stumpage Price $	130.00		
13	Value of Volume Lost $	71,572.96		

		@ 6 7/8%	@ 10%
17	Total Value Lost Without Project:	$89,485.61	$86,556.47

WITH PROJECT

1	Age	35	45	55	Mature		
2	Volume Threatened MBF	1.49	12.73	11.98	5.99		
3	Years to Harvest	25	15	5	0		
4	Volume at Harvest MBF	2.37	15.66	12.70	5.99		
5	Green Stumpage Price $	200.00	200.00	200.00	200.00		
6	Value at Harvest $	474.00	3132.00	2540.00	1198.00		
7	Present Value @ 6 7/8%	90.04	1156.02	1822.07	1198.00		Total = $4,266.13
8	Present Value @ 10%	43.75	749.80	1577.09	1198.00		Total = $3,568.64

9	Estimated Volume Killed MBF	655.43	14 Threatened Volume Salvaged	-
10	Estimated Volume Salvaged MBF (80%)	524.34	15 Salvage Stumpage Price	-
11	Estimated Volume Lost MBF	131.69	16 Value of Salvage	-
12	Salvage Stumpage Price $	130.00		
13	Value of Volume Lost $	17,041.18		

		@ 6 7/8%	@ 10%
17	Total Value Lost With Project:	$21,307.31	$20,609.82

	@ 6 7/8%	@ 10%
Project Benefit:	$68,178.30	$65,946.65
Project Cost:		
Net Present Value:		
Benefit Cost Ratio:		